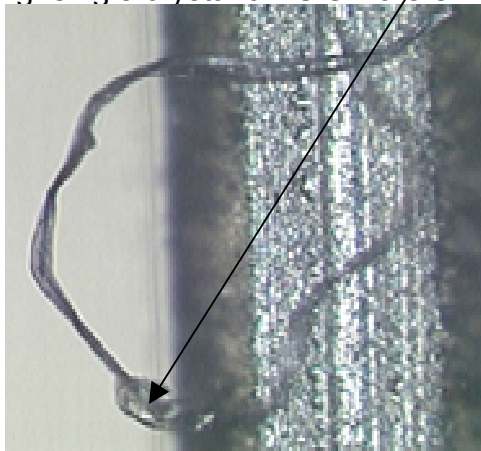


NSF Grant Number: DMR- 0203552

PI: John A. Patten Institution: Western Michigan University

Title: Ductile Regime Machining of Silicon Carbide

<p><b>•Research Objectives:</b></p> <p>The objective of the research program is to characterize the role and influence of the high pressure phase transformations of semi-conductors and ceramics during manufacturing processing such as precision machining</p>	<p><b>•Significant Results:</b></p> <p>The high pressure phase transformations that occur during machining of semiconductors and ceramics are a recently discovered manufacturing process mechanism. Techniques used to quantify this small scale material behavior include: nano-indentation, electron microscopy, micro-Raman spectroscopy. <a href="http://www.micro.physics.ncsu.edu">http://www.micro.physics.ncsu.edu</a></p>
<p><b>•Approach:</b></p> <p>This material behavior may be exploited to improve manufacturing processes by increasing yields, decreasing defects, and reducing the manufacturing costs of devices and products manufactured from these materials. The research plan extends significantly the understanding of the fundamental principles and mechanics of the deformation phenomena/ mechanisms and machining of these hard-brittle materials.</p>	<p><b>•Graphic:</b></p> <p>Ductile machining of SiC is the newest process discovery attributed to this research effort. Ductile Silicon Carbide Chips/Debris are produced by precision machining single crystal 6H SiC wafers.</p> <p>The chips/debris are amorphous - nano crystalline, indicating a ductile high pressure phase transformation.</p> <p>Appl. Phys. Lett. Dec. 8, 2003</p> 
<p><b>•Broader Impact:</b> Societal benefit is derived from:</p> <p>improved productivity and enhanced product design as a result of our scientific discoveries. One of the key outreach activities is a highly successful <b>workshop</b> focused on dissemination of information to enhance scientific understanding. <a href="http://www.continuinged.uncc.edu/hppt/workshop.htm">http://www.continuinged.uncc.edu/hppt/workshop.htm</a></p>	